

Federated Learning Meets Blockchain in Edge Computing: Opportunities and Challenges

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Abstract

Mobile-edge computing (MEC) has been envisioned as a promising paradigm to handle the massive volume of data generated from ubiquitous mobile devices for enabling intelligent services with the help of artificial intelligence (AI). Traditionally, AI techniques often require centralized data collection and training in a single entity, e.g., an MEC server, which is now becoming a weak point due to data privacy concerns and high overhead of raw data communications. In this context, federated learning (FL) has been proposed to provide collaborative data training solutions, by coordinating multiple mobile devices to train a shared AI model without directly exposing their underlying data, which enjoys considerable privacy enhancement. To improve the security and scalability of FL implementation, blockchain as a ledger technology is attractive for realizing decentralized FL training without the need for any central server. Particularly, the integration of FL and blockchain leads to a new paradigm, called FLchain, which potentially transforms intelligent MEC networks into decentralized, secure, and privacy-enhancing systems. This article presents an overview of the fundamental concepts and explores the opportunities of FLchain in MEC networks. We identify several main issues in FLchain design, including communication cost, resource allocation, incentive mechanism, security and privacy protection. The key solutions and the lessons learned along with the outlooks are also discussed. Then, we investigate the applications of FLchain in popular MEC domains, such as edge data sharing, edge content caching and edge crowdsensing. Finally, important research challenges and future directions are also highlighted.